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COMPLETE SPECIFICATION

A process for manufacturing Divided Wound Cores for Transformers and similar apparatus

We, ALLMANNA SVENSKA ELEKTRISKA AKTIEBOLAGET, a Swedish Company, of Vasteras, Sweden, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

Our co-pending application No. 25058/51 (Serial No. 696,346) relates to a process for manufacturing a divided wound magnetic core for a transformer or similar apparatus which comprises the steps of leading a ribbon of magnetic material through a punching tool, punching slits across part of the width of the ribbon at those places where the wound core is intended to be divided while maintaining the two marginal zones of the ribbon unpunched, winding the ribbon on to a winding mandrel, holding the layers of the wound core together by binding means and cutting through the unpunched marginal zones by grinding, sawing, milling or the like.

In order to obtain the desired inclination of the cut surfaces with respect to the core walls, the operating device for the punching tool is provided with a compensation means. In this manner the cut surfaces of the core halves receive the shape of a more or less inclined smooth plane. The advantage of this process is that the major part of the work of dividing the core is performed by a simple punching tool without losing the possibility of winding the ribbon into a core. The contact surfaces of the individual adjacent layers are exactly uniform, so that the magnetic losses are reduced to a minimum. The formation of burrs which may occur when conventionally wound cores are severed is completely avoided thanks to this process.

The present invention relates to a process and apparatus for further improving the transition of the magnetic flux in the butt joints between the core halves. It is known that an

overlap of the sheets in the butt joints improves the transition of the magnetic flux from one sheet to the other and this invention relates to a process by which an overlap of the ribbons of the core halves may be obtained.

According to the invention the slits across the inner part of the width of the ribbon are punched at spaced intervals at each half revolution of the winding mandrel in such a manner that the slits on the wound core are displaced with respect to one another at every layer or at a plurality of layers, so that overlaps are formed by at least two layers.

In Application No. 25058/51 (Serial No. 696,346) a continuous compensation for the control of the alignment of the slits is performed during the punching operation.

According to the present invention, the compensation is effected discontinuously but in such a manner that the sum of the compensation is equal to the sum of compensations of the corresponding continuous compensation.

The invention will now be described with reference to the accompanying drawing, in which

Figure 1 shows a ribbon 1 with a slit 2, Figures 2a and 2b show a wound core, viewed from two sides.

Figure 3 shows a ribbon with a slit 2 in one layer thereof and a slit 2' in the immediately underlying layer of the ribbon.

Figure 4 is a section through a part of a wound core, wherein the overlap is formed by two ribbon layers, and

Figure 5 shows schematically a punching and winding arrangement substantially similar to the arrangement described in Application No. 25058/51 (Serial No. 696,346), but comprising in addition a device by which the punching tool is caused to perform a reciprocating movement lengthwise of the ribbon. The amplitude of the reciprocating movement

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is equal to the length of the overlap. This distance compensation is suitably controlled by the winding mandrel.

As illustrated in Figure 5, the ribbon 1 is drawn from a storage reel, carried past a punching tool 9 (indicated by dotted lines), and wound on to a mandrel 4. It is the purpose of the invention to bring about a continuous movement of the punching tool for the compensation of the distance between the punching tool and the winding mandrel, as well as a reciprocating movement for obtaining the overlaps. For this purpose the punching tool support, according to the embodiment exemplified in Figure 5, is divided into two parts 5 and 6. The part 5 is displaced continuously to the right during rotation of the winding mandrel by means of a nut 7 threaded on to a screw 8 which is joined with the shaft to the winding mandrel 4. The part 5 carries along with it the part 6, which latter supports the punching tool 9. The part 6 in its turn is controlled by a device joined with the part 5 by means of which the part 6 is caused to perform a reciprocating movement on the part 5, in dependence on the rotation of the winding mandrel, the part 5 serving as a slide. This device may for instance consist of a toothed gear transmission 10 and a guiding cylinder 11 provided with a helical slot 12 and coupled with the transmission. A follower 13 engages in the slot 12 and is joined with the part 6 of the punching tool support. Rotation of the guiding cylinder 11 causes the part 6, together with the punching tool 9 contained therein, to be moved to and fro as indicated by the arrows. The punching tool 9 receives its impulses for the punching operation by means of a toothed gear transmission 14 and a shaft 15 with a cam 16. The punching tool 9 itself must be capable of movement with the ribbon when it is in engagement therewith. This may be effected by mounting the punching tool in the manner shown diagrammatically in Figure 3a of Application No. 25058/51 (Serial No. 696,346).

The ribbon, after being wound on to a core, may be heat-treated as usual, and if

necessary be impregnated thereafter. The marginal zones 2¹, Figure 3, on both sides of the slits 2 are removed by grinding, sawing, or milling, so that the core is divided into two parts. These are provided with the electric winding, assembled and held together in any known manner.

What we claim is:—

1. A process for manufacturing a divided wound magnetic core for a transformer or similar apparatus comprising the steps of leading a ribbon of magnetic material past a punching tool, punching slits across the inner part of the width of the ribbon, leaving marginal zones unpunched, at spaced intervals along the ribbon, one slit upon each half revolution of a winding mandrel, on to which the punched ribbon is wound, in such a manner that adjacent slits or groups of slits on the wound core are displaced with respect to one another, so that overlaps are formed by at least two layers, and dividing the wound core by removing therefrom the marginal zones adjacent to said slits.

2. Apparatus for manufacturing a divided wound magnetic core by the process claimed in claim 1, comprising a storage reel from which the ribbon of magnetic material is drawn by the mandrel, said punching tool being arranged to punch said slits in the ribbon during its passage from the storage reel to the mandrel, said mandrel being coupled with operating means for the punching tool, which operating means is adapted to cause a continuous displacement as well as a reciprocating movement of the punching tool both in the longitudinal direction of the ribbon, and means for dividing the wound core.

3. Apparatus for manufacturing a divided wound magnetic core by the process claimed in claim 1, constructed and arranged substantially as herein described and as shown in the accompanying drawing.

4. Divided wound magnetic cores produced by the process claimed in claim 1.

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